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Opportunities of the thin film laboratory at MLZ

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To solve todays challenges in energy conversion and information technology, fundamental understanding of thin films and nanostructures is required [1,2,3]. Prerequisite, however, is the fabrication of thin films. Molecular Beam Epitaxy (MBE) is a very versatile method to grow high quality and high purity epitaxial films with low intrinsic defect concentrations and atomic-layer control.

At the JCNS thin film laboratory at the MLZ, we run an oxide MBE system for the growth of various samples, i.e. "classical" magnetic thin films, transition metal oxide thin films and films for soft matter studies, like Gold layers.

However, thin film growth is a research topic on its own which requires investigation to finally obtain thin films with optimum properties. In the presentation we will give examples for high quality metal and complex oxide thin film systems like e.g. $SrCoO_x$, $La_{1-}SrMnO_3$, FeN_4 or Cu/Fe multilayers with focus on stoichiometry, morphology and thickness precision and give detailed information about the possibilities in sample preparation for users.

To enable quasi in-situ neutron scattering studies on freshly produced samples by subsequent transfer of the sample from the MBE laboratory to the neutron instrument MARIA we have developed a small versatile transfer chamber [4].

The use of the MBE setup and the transfer chamber is open for users and collaborators. Users who apply for beam time at neutron instruments like MARIA are welcome to prepare their samples on-site with our technical support.

[1] R. Ramesh and N. A. Spaldin, Nature Mater. 6, 21 (2007)

[2] J. Mannhart and D. G. Schlom, Science 327, 1607 (2010)

[3] S. Pütter et al., Appl. Phys. Lett. 110, 012403 (2017)

[4] A. Syed Mohd et al., Rev. Sci. Instrum. 87, 123909 (2016)

Summary

The JCNS thin film laboratory offers thin film fabrication for all neutron users. Simply apply within the framework of the MLZ proposal system!

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